Chapter 10

Friccohesity and Tentropy: New Models of Molecular Sciences

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Additional information is available at the end of the chapter

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Abstract

Understanding and developing new molecules in chemical sciences have been great thrust areas of research, not only to develop new synthetic methods or reaction mechanisms of new and greener experimental conditions but also to know what are the new molecule science and what are the new models which can track their new role in chemical processes and also their applications in allied interdisciplinary sciences. The SAR (structure-activity relationship) and STAR (structure-thermodynamics activity relationship) have been the most intimate theories in understanding and finding unique applications of the new molecules. Initially, simple molecules are the focus; however, proteins, hemoglobin, starch, and certain metallic complexes are also in the focus but as natural chemicals; but for past few decades, a lot of focus has been on synthesizing new complex molecules to make them suitable for varieties of applications such as solar, catalysts, biosensors, and others. Hence, it has been essential for focusing on structural sciences of the chemical substances. Dendrimers have been the invention of 1990s in the areas of biocomplexes, biomaterials which are hot thrust areas in molecular interaction engineering to focus on intramolecular potential for industrial applications. Thus, the molecule's internal structure signifies the various scientific components for playing or making their best use in materials sciences, semiconductor, spintronics, photonics, electronics, etc. Therefore, the molecule's interacting response with other molecules becomes cohesive or kinetic in nature or whether it induces structuredness or weakens the binding forces and allows more and more kinetic movement or the motion is noted or defined by friccohesity as it is expressed as frictional and cohesive forces. Thus, the friccohesity is a dual forces theory which deals with frictional and cohesive forces together and determined with Survismeter using Mansingh equation molecules [1–3].

Keywords: interaction engineering, friccohesity, intramolecular multiple forces theory, molecular dynamics, structure breaking and making, molecular motions

1. Introduction

Thereby, the friccohesity explains negative and positive deviations quantitatively, solvent structure breaking and making mechanism of the solute molecules based on the effective solvent binding in a most structured manner. If on adding solute the cohesive forces of the solvents undergo drastic decrease, i.e., the hydrogen bonds of the similar molecules are broken to the larger extent by the solute, then the cohesive force of the solvent is weakened. The weakening has been credited to an effective engagement of the solvent within 10 to 40 KJ mol^{-1}energy involvements. In this process, the solute molecules are able to dissolved in the bulk of the solvent, but when no solvent hydrogen bonding is broken then the solute is not dispersed or dissolved. For example, when oil is added in water, no cohesive forces of either is broken and no dispersion or dissolutions occurs. When cohesive forces are weakened or transformed into kinetic forces in binding or surrounding solute molecules, then the functionalization of cohesive forces into kinetic forces through frictional forces occurs. The solute molecules move in the bulk of the solvent despite structural resistance of the solvent molecules. Thereby, in this process the cohesive forces are mutually transformed into frictional forces, so the product of cohesive force and frictional forces is noted as friccohesity determined by pendant drop numbers where cohesive forces are demonstrated and the viscous flow times where the frictional forces are demonstrated. In these both measurements, the survismeter with similar dimension is used. It has been noticed that such situation is complicated in case of giant-like proteins, supramolecules such as calixarene, and smart molecules such as dendrimers where many local interacting sites exist; and rather than interaction with the outer surface of the molecule, they interact mutually within the molecules.

1.1. Quantitative magnitude of friccohesity

Such intramolecular interacting activities initiation induces numerous intramolecular motions having several isotropic phases or several self-assemblies of sites with definite order of their motions [3–5]. Thereby, the molecule is active and involve in intramolecular entropy similar to intramolecular hydrogen bonding, and such state of the activities within a single molecule are noted as tentropy. Thus, the multiple molecular factors or forces working inside the molecule are defined as intramolecular multiple forces theory (IMMFT). The IMMFT enables generation of several energy states which are expressed when FTIR is recorded, because the FTIR is direct data which track the integrated motions of intrinsic energy states subtle as an interacting site. In the processes of tentropy and IMMFT, the friccohesity plays a controlling role because each interacting site has its own cohesive force which could be oscillating on the infinitesimal mode but maintain the cohesivity along with oscillation with definite reversible forces or the frictional forces. Several forces like van der Waals, Lenard Jones potential, London dispersive forces, Columbic forces have been operational at an infinitesimal scale. Therefore, the book is aimed to deal with such sciences developing new theories and new examples with detailed explanation and insight of the intramolecular activities. Several peculiar sciences of intramolecular and intermolecular forces leading to have an overall effect could be incorporated in the book so that the book is

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able to give a transparent, innovative, new and novel science of liquid mixtures to the readers. Currently, the significance of such sciences is enhanced because of the focus on individual molecules in interdisciplinary sciences. For example, why the expressions of the molecular forces in the form of meniscus are shown only on the air-liquid surfaces in case of the liquids, probably it indicates a state of the cohesive force in case of solvent or liquid mixtures. If an example of pure liquid solvent is considered, then the molecular force factors inside the liquid phase or the bulk phase are cancelled out as the similar molecules are in the bulk. There may also be a possibility that the interfacial forces are either cancelled out or optimized in bulk, but these forces are active at the surfaces only where there are interfaces of air and liquid. However, these expressions are the outcome of interfacial molecular arrangement of the molecular forces, and hence there seems to be a natural need to deal with or to study the molecular forces, taking their accurate account in bulk where the optimizing activities work and also at interfaces where partial optimization has taken place. Hence, the friccohesity has been considered along with tentropy and IMMFT authentic vibrant physicochemical parameters to depict a state of intramolecular as well as intermolecular forces.

1.2. Interdependence of friccohesity and tentropy

There are several examples where these parameters operate like vaporization though it is a surface phenomenon but very much affected by the internal arrangements of the atomic, electronic, electrostatic forces, responsible for resulting molecular force factors. Since the molecules in the bulk are under equally distributed energy function and equilibrium in terms of their binding force and no Brownian motion works, it becomes a kind of stationary waves till the parameters like temperature, pressure, additives are added. It could trigger forces like van der Waals, LDF (London dispersive forces based on redistribution of sigma bond electrons in alkyl chain), and Lennard Jones potential keep maintaining the equilibrium inside the bulk phase. Hence, it matters that how the molecules behave in the bulk due to their shared electron pair clouds, but on a surface such vacancy exists as the partial optimization occurs, and because of the interface structures the air phase cannot accommodate the vacant force factors at the interfaces. Since the force factors are nothing but the electron clouds that despite mixing or sharing do maintain their thin boundary or better to say that the electrons of one atom of molecules do not leave to another atom during the interaction except sharing electron clouds, but even certain pairs of the solvent molecules do not share their electrons also like oil and water on benzene and water so they form or constitute liquid-liquid interface or the soft boundaries or also the movable boundaries similar to the shape and size of the liquid state materials, contrary to the solid-state materials like ethylene (gas) and polyethylene (solid state). Also the solid iodine sublimates into gas form directly as of ammonium chloride. Thus, there is an urgent need to maintain the structural identity of the molecules, because later they have to perform functions like drugs, catalysts, hormones, enzymes, etc. Contrary to the surfaces phenomenon, the melting points, freezing points are deep processes taking place only in the bulk phase that starts from bottom whereas evaporation, surface tension, etc. occur on the surfaces where only the partial optimiza-

tion works, but in case of MP (melting point), azeotropic, hydrated complexes and FP (freezing points) initiate from the bottom of the containers.

Thus, it is seen that the highly polar molecules freeze at lower temperature but weakly polar at the higher temperature because of their kinetic energy as the weakly polar molecules do have weaker cohesive forces and keep colliding so to bring them to a solid form needs more and more cooling and so are solidified at very low temperature, such as nitrogen, which solidifies at less than −200°C. So, the N_2 gas has weaker cohesive forces and stronger frictional or kinetic forces. For example, the water having 91.97 mN/m surface tension gets evaporated at100°C, but ethanol with 22.6 mN/m gets evaporated at 78°C. The water has dipolar structures with van der waals forces, but the ethanol also has hydrophobic shorter alkyl chain that does not allow much or stronger IMF in the bulk and its outcome is noticed or extended to the surface with 22.7 and 78 data. For making bulk phase most active heating, mechanical stirring or chemical additives are used so that the unequal distribution of the internal potential could be generated. Why is it so? Because the new chemical additives, on heating or mechanical pressure, destabilize the equal distribution of the molecular force factors (MFF) where they become haphazardly distributed or unaligned. It is noted that anisotropy state of the MFF make bulk phase active similar to the activities at ALI (air-liquid interfaces).

2. Constitutional framework of friccohesity and tentropy

Thus, an interesting science exists between the activities of the bulk and air phases because of the different structures at the surfaces, thus it becomes a most interesting thermodynamics, kinetics of reorientation of MFF, because of creating different molecular structures of disordered motions in different directions so that the MFF becomes irregular in state.

2.1. Distribution of molecular forces

Such forces structurally affect the velocity gradient on viscous flow like $\partial u/\partial y$, where u is velocity cm/sec and y is distance (cm, nm) on y axis. Thus, it becomes similar to the phase as amorphous substances where each phase does have specific heat capacity and then show different expressions, and hence the linear and nonlinear viscous flows are generated in fluid dynamics and mechanics. The linear or laminar flow is easily explained because of an additive effective but a nonlinear flow predicts some structural transitions caused due to dissolution, association, aggregation, coalescence, or others. These changes alter the molecular behaviour during capillary flow with certain variability where a degree of variation is determined with the magnitude of the friccohesity data. Therefore, in case of plate theory it is assumed that the unit area of rigid solid wall applies opposing forces F on the laminar layer formed when the Newtonian liquid is permitted to flow. It becomes a best example of frictional forces because the molecules of the liquid contained in the unit area of the laminar layer want to go ahead but the opposing forces of the rigid wall counteract them. Ultimately, facing opposition of the opposing forces the molecules succeed in crossing over such hur-

dle because the frictional forces were weaker and could not stop flowing. However, it becomes most prominent when the liquid of high viscosity is permitted to flow, it is seen when the hard liquid flows down, for example, honey whose viscosity is about 2000 cP or mPa.s, which does not flow within the capillary of smaller id (inner diameter) because the F is stronger, and hence we need some space where less F is applied; otherwise, it becomes impossible to measure their viscosity.

In case of highly viscous liquids such as honey and glycerol, which have 1490 cP, they do not much involve in laminar flow because of their exceptionally stronger hydrogen bonding which do not allow molecules to flow so easily as of water and ethanol. For them, the velocity gradient is very high and hence they flow slowly because their molecules are not reoriented. Thus, it becomes a most pertinent question that how the molecules orient and reorient when they are in hydrogen bond networking or in contact of the plate assumed on the rigid wall of unit surface area noted by A. Interestingly, it also triggers liquid-solid interfaces; thus, the id, structure, dimension of survismeter matter a lot in case of causing kinetic energy correction which was not considered. Also, the cohesive forces in liquid mixtures respond during opposing forces, and hence these molecules face the plate area despite this interface they maintain the molecular dynamics and molecular mechanics. Therefore, it becomes a question of discussion which may lead to develop a new theory apart from friccohesity-like patterns of molecular motions, distance of hydrogen bonding, because HB distance matters a lot, which defines the manipulation of forces seen in extraction, separations, binding, evaporation, capping of nanoparticles, and functionalization of graphene as carbon nanotubes.

More interestingly, the torque and frictional forces become the most prominent for these situations. So such scenario could open a new facet of molecular interaction engineering leading to thermodynamics of structured liquids. Thus, the LLI have ventured with electronic, hydrophilic, hydrophobic, geometrical, electrostriction like cis and trans forms of H atoms. LET and LEM local equilibrium thermodynamics and local electronic motions, respectively, work on the infinitesimal mode to assist the friccohesity so that structural transitions are avoided. Till date, the viscosity theories existing could not take an account of the potential of plate liquid-solid interface (LSI) and so could not answer the treatment of actual behavior like how could these localized dynamics and mechanics (LDM) could affect the atomic motions, bond twisting, torsion, stretching, scissoring, rocking in planes and out of the planes. So, the friccohesity comes into existence because it takes into account the DM in terms of cohesive forces and also the frictional forces. So, anyone is in position to answer the complications of fluid dynamics of the giant molecules within prescribed experimental conditions and dimensions of the survismeter. Thus, the friccohesity is directly proportional to the stretching frequency of the molecules, and there is an urgent need to track all the surfaces of the molecules which undergo such changes.During such situations, the inner part of the molecules as per molecular dynamics, mechanics get freshly reoriented and the molecules with these activities maintain stronger rigidity and electronic stability [6–8]. They remain intact intramolecular; however, intermolecular forces undergo changes. Thus, the friccohesity is in relation with UV, visible light, FTIR, quantum chemistry.

2.2. Molecular bioengineering and molecular shock

In light of spectroscopic and thermodynamic scales of molecular identification, it seems valid that the friccohesity, tentropy, and IMMFT, the new concepts, become the most relevant and wanted tools to define overall interacting behavior of molecules. Since the molecule does have localized electrons cloud with stronger chemical bonds, which support the molecular motions with definite energy noted as follows.

$$E = \frac{1}{2}mv^2 \ or \ E = \frac{1}{2m}m^2v^2, \ p = mv \ or \ p^2 = m^2v^2 \ \text{or} \ E = \frac{p^2}{2m}$$

Thus, if the molecules move from one point to another, they have energy or momentum as is listed in above equation. Such mass flux could have effect on the muscle or on other objects, which is noted as molecular shock; in practice it is noted when the hot water is used as heating agent to warm up the wanted object. Such molecular energy is obtained when the molecules on getting heat oscillate with definite kinetic or oscillatory or rotational or translational energies. Since a single molecule shows so many wave numbers in FTIR, these different stretching sites of molecules could have LET (local equilibrium thermodynamics), LEM (local equilibrium molecular dynamics), local energy distribution arrays (LEDA) with certain tentropy, and IMMFT scales of parameters of specific magnitudes. For example, the solubility of cholesterol attained through simple vegetables juices act as friccohesity destabilizing agents. Therefore the nature of juices or extracts of fenugreek, garlic, ginger, turmeric, butter guards etc. could have valuable physicochemical properties which may dissolve the cholesterol leading to have a useful bioengineering process. Several *in vitro* experiments are being conducted using survismeter which could explore and elucidate a role of friccohesity and tentropy as flux and force theory. Also magnetically, the rheological properties could be developed and hence the data could become the most effective to hammer out the cholesterol by physicomechanical methods. Therefore, the magnetic forces applied during viscous flow give an opportunity to the experimenter to identify a role of functional groups or the arrangements of coupling constants. Also, the multiple capillaries are effective to see whether there is some natural law of selection of reorientation of the motions, which may be useful in proteins. Molecular alignment of one solvent toward LLI (liquid-liquid interface) with respect to the immiscible solvent when brought together could also lead to develop molecular motions at LLI or in bulk of each solvent. Therefore, the molecular alignment of both the phases toward LLI could lead to:

Isotropic science at LLI or in individual phases

Alignment toward micelles

Sensing of double bond detection

Hydrogen bond and radii determination

Kinetic energy and surface inhibition activity

Nanoparticles like Au, ZnO, SiO_2, Ag, alkane thiol capping ability

Drug-binding ability of the dendrimers

Rationalized hydrodynamic volume that retrieves the viscosity B coefficient

Contribution of loan pair electrons of surfactants or the double bond of tweens which are determined with survismeter

Oscillating crystal for density in liquid mixtures is informatory

Thus, the friccohesity and tentropy study aligning the molecular orientation leading to form the favorable force patch noted as CF it could also be tracking that some of the molecules with higher KE (kinetic energy) could be out of the phase isotropy.

2.3. Interfaces of friccohesity of molecular solutions

1. How do molecular structures affect the overall interacting behavior with solvents polarity, functional groups, electronegativity, hydrophilicity and hydrophobicity?
2. How do van der waals forces, London dispersive forces, and Lennard Jone potential work interacting activities?
3. Structural input to the molecular interactions and reorientation of the molecules

Friccohesity of pure chemical compounds is a most important data, for example, the friccohesity of the pure water at specified temperature indicates purity and entropy level of the water. It is noted that the change in temperature induces a change in internal pressure because on raising the temperature the CF are weakened and the FF are strengthened as the molecular motions are intensified. Therefore, the molecular networking developed because HB gets weakened and motions are intensified. Thus, the friccohesity is applicable in case of pure substance. Thus, the friccohesity is directly proportional to the kinetic energy and the molecular motions. It is also applicable to the rule of the Kelvin, van der Waals, Lennard jones potentials. Actually, these scientists could not visualize the real picture of the molecular forces without going in deeper look of the molecular dynamics. The friccohesity is very much connected to the molecular dynamics because the CF and the FF are possible only when the molecular identity is maintained, otherwise the concept is not applicable. Thus, the friccohesity of catalyst could be possible because the catalyst allows the adsorbate molecules to adhere to the surface of the adsorbents. It is possibly when the adhesive forces are developed. Therefore, the types of the friccohesity are made. For example, if the cohesive forces are between the similar molecules, then it is symmetric friccohesity; but when it is applicable when solid and liquid develop cohesive forces like adsorbate and adsorbent where the adhesive forces work rather than the CF. Thus, in such cases the friccohesity is noted as asymmetric friccohesity.

In case of the Arrhenius equation, the following equation is used for determining activation energy when the reaction goes on.

$$k = Ae^{-\frac{E}{RT}} \qquad (\text{eqn.1})$$

Taking natural log, the eqn.1 becomes as follows.

$$\ln k = \ln A - \frac{E}{RT} \text{ or } 2.303 \log = 2.303 \log A - \frac{E}{RT} \text{ or } \log k = \frac{2.303}{2.303} \log A - \frac{E}{2.303R}.\frac{1}{T} \quad (\text{eqn.2})$$

Thus, the final equation is developed as given below.

$$\log k = \log A - \frac{E}{2.303\,RT} \quad (\text{eqn.3})$$

The eqn. 3 could also be applied for any physicochemical indicator.

$$\log \eta = \log A - \frac{E}{2.303\,RT} \quad (\text{eqn.3})$$

The k is reaction rate or rate constant attained when the forward and backward reactions gain equal thermodynamics equilibrium or the Gibbs energy = 0; the temperature remains constant; the molecular motions are optimized; and not any transition state is developed. Therefore, eqn. 3 depicts the non-transition state except equilibrated state. Also η is viscosity, thus the unit of k is the unit of A noted as frequency factor as the reaction rate depends on the frequency of collisions. Therefore, any other or similar condition could be fitted in place of k. It is noted that the viscosity, surface tension, friccohesity, and other parameters are depicting the interaction phase with constant state of the molecular phases or the state. It is noticed that the unlimited changes in the molecular motions in molecular processes in varieties of medium and experimental conditions do occur, which could be defined by several orders in terms of entropic sciences or friccohesity domains. Therefore, integrating the changes, the well-defined kinetics of molecular processes could be developed considering their tentropic domains with separate partition functions (w) is noted as in eqn. 4.

$$S = k \ln w \quad (\text{eqn.4})$$

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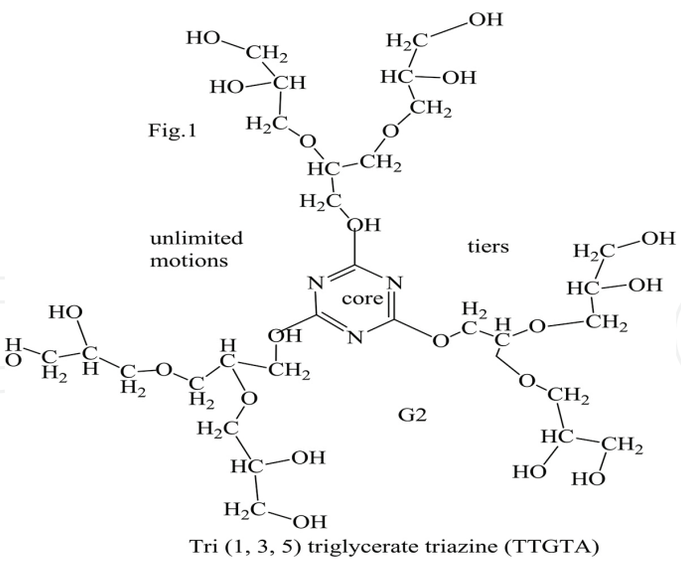


Figure 1. Innumerable isotropic orientations with rigorous molecular orientations in Tri(1,3,5) triglycerate triazine (TTGTA), a second-tier dendrimer.

Here, S is entropy, k is Boltzmann constant, w is partition functions; if any molecule has unlimited orders of the motions, S is higher where the tentropy is higher as per IMMFT model. Tri(1,3,5)triglycerate triazine (TTGTA) (**Figure 1**) is a second-tier dendrimer molecule which has different parts in different isotropic orientations with wider and rigorous molecular orientations, which affect the solvent molecules during flow [9–11]. Thus, the kinetic model of molecular activities could be extracted and developed in terms of physicochemical responses of the molecules with respect to the solvent and the experimental conditions.

For example, a first-order rate reaction could be fitted with k as rate constant and the unit of k is s^{-1} which is frequency per second of successful collisions for developing forward and backward reaction rates.

$$k = \frac{a}{(a-x)t}$$

When x = 0.5 or the 50% transformed from reactant to the product, so putting x = 0.5 from initially a = 1, solving 1= 0.5 = 0.5.

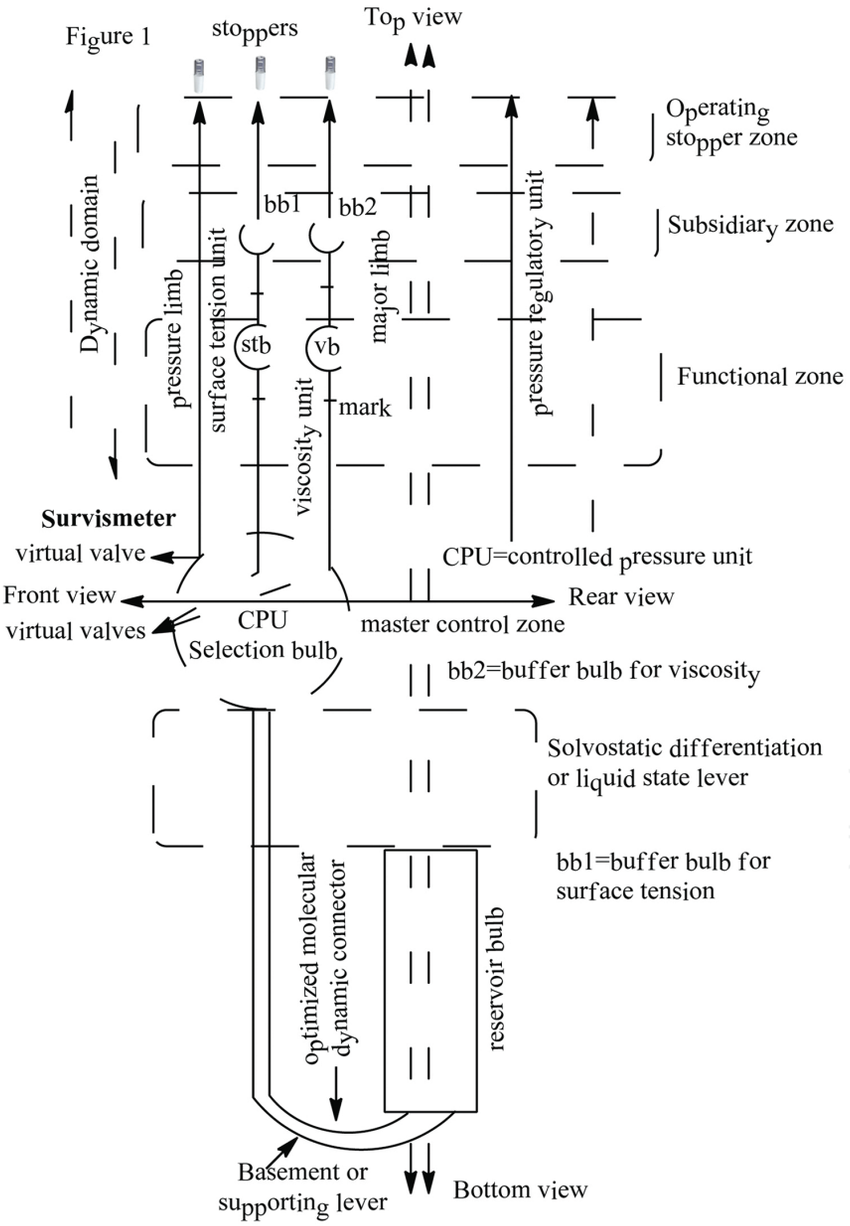
$$k = \frac{0.5}{(1.0-0.5)t} \text{ or } k = \frac{1}{t} \text{ or } k = s^{-1}$$

Thus the unit of k is s^{-1} noted as frequency factor; thus, if k is replaced by the viscosity, then its unit is Pa.s or kg $m^{-1}s^{-1}$. Thus, the mass transfer which does not react but interacts and gains a specific order of the molecular motions and orientations may be resulting as a laminar flow or the non-Newtonian flow. Therefore, the comparison of k and viscosity could be the most

interesting combination. Thus, considering the overall molecular stretching and oscillatory patterns, the net vector forces in case of ionic liquids, giant molecules in the area of supramolecular chemistry could be the most deciding in understanding the overall activities of the molecular species.

2.4. Determination of friccohesity

New creative ideas in respective areas of research and teaching work well provided a focus is on creating something new superseding the existing sciences in that specific area; it has to be absorbed in creative brains. Since time immemorial, the varieties of new creations have been the new state of arts and in succeeding steps have been the new path of development where



no new idea, bigger or smaller, loses its identity as the scale is based on the need and also creating new needs or applications. Thereby, right from late thirteenth to late fifteenth centuries, there was a huge hunger of idea developing and modeling something new as alternative sciences, which further led to a new era of industrialization of fundamentals from sixteenth century onwards, may be James Watt's vapor run engine or Robert Boyle's equation for ideal gases. Thus, the creativity has been the prime object of research and teaching in all the time of civilization. The Ostwald viscometer, Ubbelohde viscometer for viscosity, or Traub's stalagmometer for surface tension studies have been the foundation stones in measuring valuable physicochemical properties of liquid mixtures. Contrary to their work for measuring the parameters individually, the new research methodology named as survismeter has been successful in measuring surface tension, viscosity, activation energy, interfacial tension, wetting coefficient, and friccohesity. Currently, this new state of art is patented and 7 commercialized by Borosil named as Borosil Mansingh Survismeter (BMS). Schematic 8 illustration of survismeter is noted in **Figure 2**. There are four views of the survismeter, the top where stoppers are fitted to monitor the pressures and facilitate the liquid sampling and flow inside the bulbs. Number two is the bottom view which supports the anchoring of survismeter on the basement to keep the survismeter vertically at right angle maintained by spirit level. Thirdly, the front and rear views where the front view assists in taking measurements of the viscous flow times and pendant drop numbers for calculation of the viscosity and surface tension, respectively. The survismeter also contains virtual valves opening in the CPU or selection bulb or wisdom bulb and operates on 1:1 channel. The virtual valves are monitored by the stoppers to be fitted on the top opening of the survismeter units. The sample is loaded through the major limb without any air trap, especially in case of the surfactants or the ionic liquids which could trap air bubbles and create hurdle in natural fluid flow.

The subsidiary zone explains equilibration of the liquids in buffer bulbs whereas the functional bulbs explain the main bulbs where the prescribed liquid sample is filled and allowed to flow through standard orifice within the marks noted on the capillaries.

The data of several physicochemical properties generated on authentic reproducibility, high resolution, and repeatability modes have been published in American Chemical Society, Royal Chemical Society including several journals of leading publishing companies. The survismeter is being used by numerous industries such as inks, soaps and detergents, resins, nanoemulsions, along with introduction of academic curricula of several educational and research institutions. Thus, the science and potential of survismeter is most effective for study of multiple physicochemical properties of liquid mixtures. Science invention and craze (SIAC) creates a lot of self-inspiration to do more and more in life; there is only the craze that fills up new energy to move forward for more work of new nature and new beginning.

2.5. Determination of Brownian motions

The nanoemulsions are different from the solutions because the hydrophobic part could not interact with water if used as solvent and hence move toward surface in haphazard motions as the solvent is unable to develop stronger IMF. The alkyl chain thus involves in uncontrolled

motions in 1, 2, and 3Ds and thus is measured comparing the friccohesity of solutions with the equation noted as follows.

$$\text{Brownian motion} = \frac{\sigma_{IS} - \sigma_{SS}}{\sigma_{IS}} \times 100$$

The σ_{IS} stands for friccohesity of ionic solutions, σ_{SS} stands for friccohesity of surfactant solutions. Here the solvents are common; in most cases, the water could be an excellent solvent for both the ionic and the surfactant solutions. Also the difference in friccohesity data of two solutions as noted in the following equation could visualize the state of the Brownian motions.

$$\text{Brownian motion} = \text{friccohesity of ionic liquid} - \text{friccohesity of surfactant}$$

2.6. Scavenging activity of the antioxidant of free radicals

The studies could be extended for these activities determined with survismeter using the following equation.

$$\text{Scavenging activity} = \frac{\sigma_m - \sigma_S}{\sigma_m} \times 100$$

The σ_m and σ_s represent friccohesities of medium sample respectively at the prescribed experimental conditions. Similarly, the scavenging activity could also be calculated using the following equations.

$$\text{Scavenging activity} = \frac{\eta_m - \eta_S}{\eta_m} \times 100$$

$$\text{Scavenging activity} = \frac{\gamma_m - \gamma_S}{\gamma_m} \times 100$$

The symbols η and γ depict viscosities and surface tensions, respectively.

2.7. Golden rules of survismeter science and applications

The factors making survismeter a green and clean science for wider acceptability and use are listed as follows.

1. Critical reasoning of hypothesis and mechanism already used in surface tension and viscosity theories and to look for undiscovered or untouched or hidden interfaces and possibilities of new hypothesis

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2. Ludwig Boltzmann energy distribution theories of energy homogenization and capping of nanoparticles
3. Rudolf Clausius entropic factors for homogenization and Gibbs Helmholtz energy
4. Boon and newly established novel sciences in areas of solutions and emulsion chemistries
5. Functional asset of liquid-solid interfaces
6. Combination of uniform functional capillaries for continuum and noncontinuum liquid flows within a length aligning and reorienting the molecules.
7. Establishes an operator noted as friccohesity, between continuum and noncontinuum fluid flows
8. Wonders of bulbs noted as CPU (controlled pressure unit) or selection bulb
9. The 1:1 channel selection wisdom or rule of CPU
10. Geometrical isomerism and symmetry in shape (GIASH) of functional bulbs, made for surface tension and viscosity measurements, as most critical coordinates of the survismeter noted as most specified coordinates
11. Transforming CF into AD around uniform glass circular surface with uniform surface tension, roughness, surface forces for the purpose of PDN formation and detaching kinetics
12. Liquid accessibility and development of excellent uniform liquid distributions around an exposed area of extreme lowermost tip of the capillary.
13. Distributions around uniform surface energy and liquid so that the nature of CF into AD are functional in PDN formation and falling that lead to equal distribution of the forces in all directions for excellent result.
14. Drop formation and size depending on liquid density in all directions so that the stress and strain are not developed.
15. Study of stress and strain on the drop formation must be completely avoided because of a jacket of CPU and vertically at 90 degree angle.
16. Flow remains constant and remains like a current which makes backlash and back jerk to influence the quality of data, so that the extruded distance of capillary is optimized and monitored by pressure regulatory limb (PRL).
17. The withdrawal of the pressure regulatory story is withdrawn smoothly so that no air bubble or some additional mechanical energy is not created inside the liquid filled in reservoir bulb.
18. Pressure distribution inside CPU is excellently and naturally distributed during the fall of PDN assisted by PRL.
19. Distance between the terminus of an extruded capillary and lower orifice of CPU is optimized to avoid the creation of mechanical energy and air trapping.

20. Entrance of the viscous flow capillary is at 45 degree angle so that backlash and jerking are avoided during measurements.

21. Top coordination among physical parts, orifices, capillaries, angles, opening, and regularity actions is made for accurate, reproducible, and reliable data.

22. Vertical positions alignment effect on fluid flow.

23. Asset for study of viscoelastic fluids noted as MRF (magnetorheological fluids) external forces.

24. Novel science for study of aero emulsions or aerated solutions for determination of adsorbed air, for example, adsorption of O_2 and CO_2.

25. Vertically aligning uniform flat plate at the top of survismeter.

26. UV and IR sensing mode of reservoirs bulb and magnetic doses to functional bulbs.

27. Friccohesity model of rupturing of molecular membrane to determine membrane strength made out of holding hydrophobic interactions together like lipid membranes.

28. Asset for study of rupturing/distorting of lipid membranes made up of hydrocarbon-water that decrease surface tension from $\gamma_0/_w$ ~ 40 mN/m by analogy to disappearance of surface pressure in a lipid monolayer under large expansion at an oil/water interface.

29. IMMFT and thermodynamics of biomembrane ruptures (1 to 25 mN/m) based on lipid composition and rupture strength is a dynamical property.

This is not the question of measuring many parameters together, but it is the essential need since no such research methodology exists that is why people could not think and work with individual measurement as in isolations; however, simultaneously measurements go multi-faceted like redox, kinetics where complementary part characterization is essential. Thus, the purpose of measuring viscosity is to find out solute-solvent interactions, and currently the entangling or the trapping of the solvent with solutes or other chemical species like drug in dendrimers. This is supplemented by the surface tension or better known as coalesce or the cohesive forces [12].

The difference in fluid flow velocity and pendant drop numbers on loading the molecules in capillary flow of the survismeter gives the idea of solute-solvent interactions, size, shape, enthalpy, entropy, tentropy, IMMFT, friccohesity. Therefore, the difference in velocity between adjacent layers of fluid is listed as a velocity gradient depicted in simple terms as v/x, v is velocity difference and x is distance between the adjacent layers. To keep one layer of fluid moving at a greater velocity, the adjacent layer and a force F are necessary. It induces a shearing stress F/A. The 'A' is surface area in contact with the layer moving ahead. Also, the enthalpy released in process could be noted as follows.

$$\Delta H_{LBL} = friccohesity_{solution} - friccohesity_{solvent}$$

LBL stands for layer by layer flow in a closest manner during the viscous flow.

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3. Friccohesity golden theme in nanoemulsion

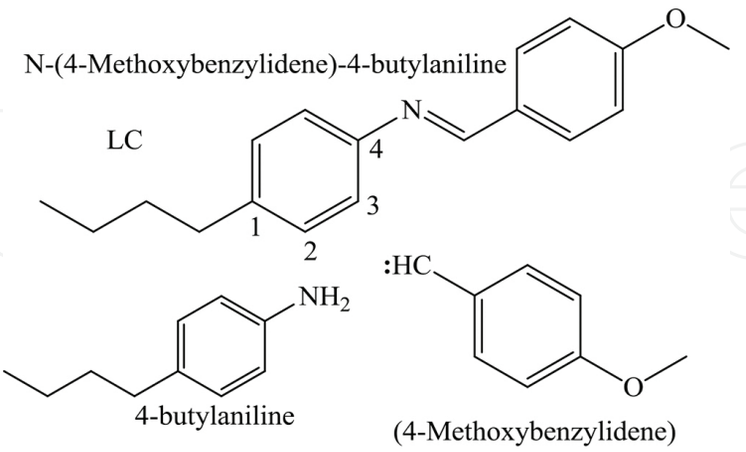
The friccohesity becomes indispensable data in case of IL (ionic liquids), LC (liquid crystal), TGL (triglycerides), and NEL (nanoemulsions) because these molecules develop dispersion of hydrophobic part in aqueous phase, but at the same time their hydrophilic part develops different activity with water. Briefly, hydrophilicity induces enthalpic activity whereas hydrophobicity induces entropic activities, but at a nanometer range. Thus, the hydrophobic part by attacking structured water with definite Brownian motion leads to induce frictional forces as its cohesive forces are weakened, then only it is able to disperse in structured water. Similarly, the hydrophilic part leads to develop binding forces on disrupting structured water with more weakening of hydrophilic-hydrophilic transforming toward hydrophilic-water linkages. In hydrophilic-water linkages, more weakening of CF takes place and this could also lead to act as a favorable factor for increasing frictional forces too. Thus, the frictional forces in the form of hydrophobic tail causing Brownian motions are favored and also in case of the hydrophilic-water head weakens surfactant self-binding to its binding with water. If higher is Brownian motion, the surfactant approaches the surface of the liquids mixtures and settles at the surface; when the surfactant reaches to surface and gets settled at the surface, then the surface energy is utilized in larger amount. Thus, weakening surface energy, which is formed out of unbalanced molecular forces (UBMF) of the solvent molecules, leads to develop molecular reorientation to optimize the forces as per their geometrical activities. This process or movement of larger surfactant molecules to surface is noted as surface excess concentration occupying per unit area of the surface. At surface, still two thermodynamics domain work, one hydrophilic and another hydrophobic where hydrophobic dominates and surface tension decreases with higher pendant drop numbers if measured with survismeter.

At the same time, in such a situation the frictional forces also become active and in fact increase if measured in terms of viscous flow time using survismeter. In general, it is seen that in case of nonelectrolytes the surface tension decreases, resulting in an increase in viscosity which proves that on surfaces excess concentration is higher and bulk concertation is lower. This theory is defined by friccohesity as both the forces are active in such liquid mixtures; however, conductance could be another data which plays an important role in defining the exact location and binding and mobility of the molecules with higher forces or the lower forces. It is also defined by Walden product, but there is a need to also incorporate the surface or the CF forces somewhere in the ambit of the Walden which is not an effect for emulsion, thus the new version could be presented as physicochemical molecular mimicry (PCMM). The equation is noted as follows.

$$\mathrm{PCMM} = \left[(\mathrm{pdn})(\mathrm{vft})(\mathrm{OD})(\mathrm{density})(\mathrm{conductance})\right]$$

The pdn depicts pendant drop numbers, vft viscous flow time, OD is optical density, density is self-explanatory, conductance, and these parameters integrated offer the physicochemical profile of the molecules in any working medium and working experimental conditions. The

N-4-methoxybenzylidene-4-butylaniline could generate effective friccohesity if dissolved in several solvents under variable temperatures.



Also, the ionic liquids noted in the following could also develop very useful liquid mixtures, may be with metallic nanoparticles of the magnetic nanoparticles as an effective medium for light-sensitive process or the heat-sensitive processes. Both the ionic liquids 1,7-bis(3-methyl-imidzolium-1-yl)heptane and 1,8-bis(3-methylimidzolium-1-yl)octane could develop stronger solubilization of two immiscible solvents dissolving insoluble pollutant to recover them or to transform them into safer chemical forms, which may be used as medium, washing reagents, or coating materials. Their percentage solubilizing strength with respect to their hydrophobic chain could be estimated with their interfacial tensions with respect to air-liquid-interface (ALI) and liquid-liquid-interface (LLI). The ALI acts as standard data whereas another solvent, when used in forming LLI, is used as the test case or the sample. For example, air-water-interface is most widely used as standard if pure water is used in the experiment in a laboratory of pure air. The interfacial tension of ALI system is 71.97 mN/m (milli Newton per meter), but when CCl_4 is brought in contact with water, then the system is noted as LLI which has its own IFT.

$$\text{Mutual solubilization} = \frac{\gamma_{\text{ALI}} - \gamma_{LLI}}{\gamma_{ALI}} \times 100$$

The γ symbol indicates surface tension of the systems, thus γ_{ALI} indicates interfacial tension of the ALI, and γ_{LLI} the interfacial tension of the water-CCl_4 interface. Thus, γ_{ALI} is noted as standard and γ_{LLI} as the sample or the test sample [13]. Similarly, DPPH free radical scavenging activities by ascorbic acid or dendrimer in two immiscible solvent systems could be determined with the following equation.

$$\text{Scavenging activity} = \frac{\gamma_{\text{ALI}} - \gamma_{LLI}}{\gamma_{ALI}} \times 100$$

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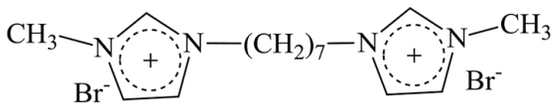
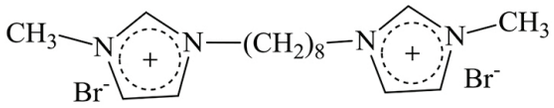
The LLI and also their impact on solubilization with series of alcohol, ketones, ester, organic acid, and mineral acids could be the most interesting experiments. Since interfacial tension is the most effective data for study of mutual solubilization of two immiscible liquids or any third component in the two.



1,7-bis(3-methylimidazolium-1-yl)heptane bromide



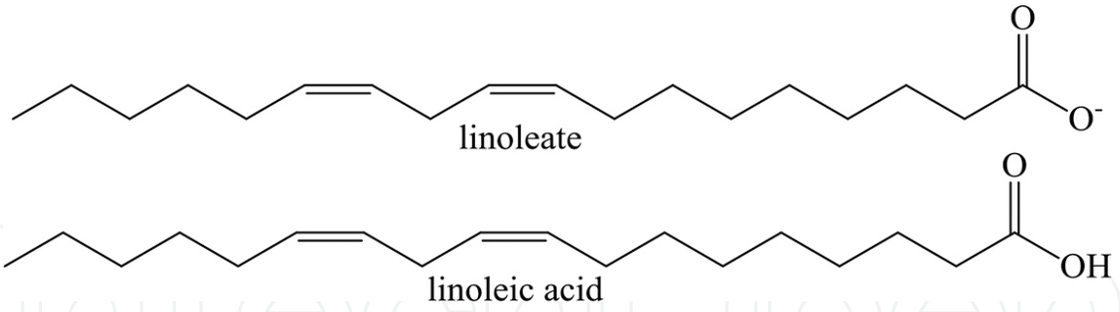
1,8-bis(3-methylimidazolium-1-yl)octane bromide

3.1. Friccohesity and tentropy for study of ionic liquid-based nanoemulsion

Quantitative study of friccohesity and tentropy of biomolecules like proteins, LDL (low density lipoproteins), in liquid media constituted of biocompatible ionic liquids at variable temperatures and pH could lead to develop new dimension of the liquid materials apart from ionic liquids, liquid crystal. Such liquid materials could be noted as isotopic or anisotropic liquid materials (IALM). Since the IALM are new study and no such concept is reported till date and no data on in vitro molecular arrangements are reported, and thus being potential population of the several substances in a most organized or nonorganized form could perform several tasks like medically essential outcome to prevent cardiovascular disease, fluid dynamics of the study, friccohesity engineering of the liquid mixtures, thermodynamical significance of the compositions of the LDL and IL, surfactants, TGL, homogenization of the liquid mixtures prepared out of various proteins, their effects on proteins conformations, their isotropy study, their spintronics, their micellization and aggregation. There are several surface area-based processes where the molecules do have entropic shock cum Brownian motions: Tyndale effect on molecules motions, Lechatelier and van der Waals' theories, Mansingh equations, UV and visible light effect, effects on free radical, tracking activities of the cancerous drugs, effect on drug solubilization, dendrimer effect on LDL emulsion, curcumin effect on emulsion, LC effect on nanoemulsion, DLS pattern aggregation, clustering, coalesces.

3.2. Biocompatible LDL nanoemulsions to dissolve fats in the body

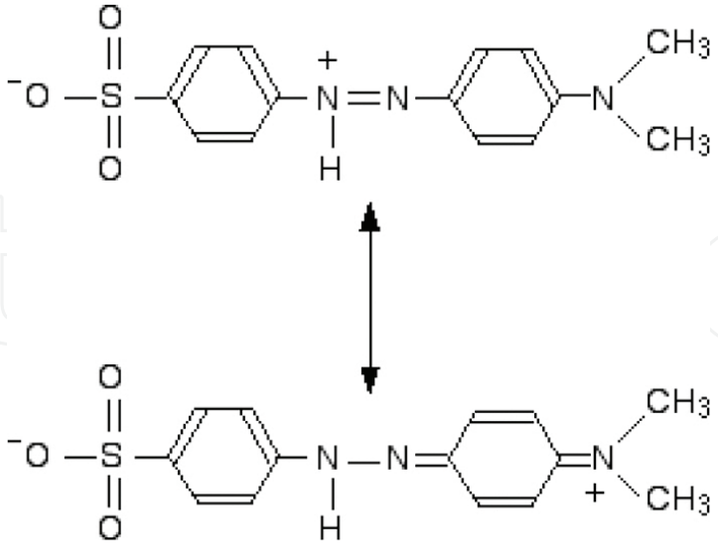
The LDL particle effectively enables emulsification by surrounding fatty acids to push them to extracellular fluid. Each LDL particle contains a single apolipoprotein B-100 molecule (Apo B-100, having 4536 amino acid residues of 514 kDa), along with 80 to 100 ancillary proteins. The LDL has a polyunsaturated fatty acid hydrophobic core of linoleate and hundreds to thousands (≈1500) of esterified and unesterified cholesterol molecules.



The core carries varying numbers of triglycerides and other fats surrounded by a shell of phospholipids and unesterified cholesterol, as well as a single copy of Apo B-100. The LDL particles are ≈ 22 nm diameter of ≈ 3 million daltons. Since LDL particles contain a variable and changing number of fatty acids, hence there is a distribution of LDL particle mass and size. Determining LDL structure has been a tough task because of its heterogeneous structure as a structure of LDL at human body temperature in native state, with a resolution of ≈ 16 Angstroms using cryo-electron microscopy, has been recently described.

3.2.1. Friccohesity of shifting of electron

Titration as an effective method utilizes reacting species as per a law of mass action which undergoes or materialized through structural activities [14]. For example, the structure of methyl orange from red to colourless depicted as canonical forms of reduction and oxidation. Of course, countless such species are generated but two out of them have been studied as delocalized structure noted in the following.



Thus, the titration at several time intervals could have different states of molecular dynamics and molecule expressions of forces with definite friccohesity and tentropy because several asymmetric structures exist. Such intramolecular dynamics or activities induced on several intramolecular motions develop countless arrays of motions or orders, which lead to develop

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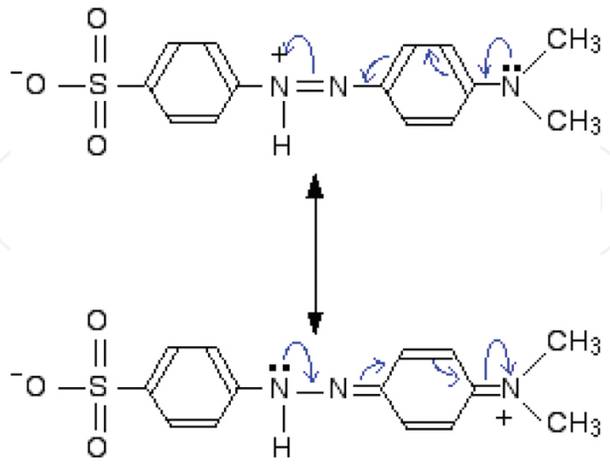
intramolecular entropy noted as tentropy. Therefore, the movements of electron in structure show that how the mutual structural changes occur as noted in the following.



However, the electrons do not fully shift to either side, but remain in benzene case and an actual structure resonate somewhere in between these. It is most interesting to determine the friccohesity at each interval so that the intermolecular forces are determined with respect to a shift in the electrons within the structures. Therefore, the titration could be performed in the solution reservoir of the survismeter to estimate the possible changes, although the canonical structures may not have any effect on the geometrical changes like in bond lengths or bond angles. The lone pairs on N atoms induce delocalization and all the bonds around these N atoms remain in the same plane and the lone pair sticking up facilitating sideways overlap with orbitals on the subsequent next-door atoms. Hence, a kind of host canonical forms with double and single bonds along with positive charge located at various places around the rings and on the other N atom, and such structural orientations make these systems most active and suitable for the study of friccohesity of such liquid mixtures. It could be more interesting if the ionic liquids are also mixed with methyl orange for understanding of the multitude of canonical forms that induce delocalization. Therefore, the catalytic molecules may develop green upper critical solution temperatures using such systems with two immiscible solvents.

4. Future prospects

Thus, the friccohesity and tentropy, which deals with molecular or ionic forces in liquids mixtures, could effectively be applied or extracted and retrieved useful ideas about their behaviors.

New experimental research methodologies could be developed as follows.

1. Friccohesity, as new physicochemical property, assists formulation of molecular liquids.
2. Tentropy, new intramolecular potential for drug loading or adsorbing toxic metals.

Thrust areas of research studied in the proposed academic plan and project are as follows:

1. Molecular interaction engineering
2. Phase extraction based on chemical affinity and CF
3. Ionic liquids and their physicochemical properties
4. Enthalpic studies of salts based on Hofmeister series
5. Structure breaking and hydrodynamics molecules of
    a. Biomolecules in varied aprotic polar medium
    b. Salts on increasing size
    c. Re-engineering of solvents by salts
    d. Increase in friccohesity indicating structure breaking
    e. Dendrimers in increasing tiers
    f. Ionic liquids in increasing alkyl chain in imidazolium ring
    g. Flavonoids in increasing OH and double bonds
    h. Surfactants in increasing I+ effects
6. Nanochemical sciences of structured and non-structured miceller liquid mixtures
    a. Hydrophobicity and hydrophilicity of interacting molecules
    b. Brownian motions and hydrodynamic volumes
7. Adsorption and surface area of adsorbents
8. Heat capacity and mass transfer rate within rigid one-dimensional box
9. Enhanced intake of curcumin in nanoemulsion
10. Saving detergents during washing clothes kitchenwares
11. Pesticides in fields
12. Sprayants in houses
13. Hydrology and percolation of water
14. GPC and molecular weights of the materials
15. Aligning molecules isotopically on capillary flow and generating electric response
16. Viscous flow with ionic liquids for electric generator replacing concentration cells
17. Viscous flow of salts aqueous solutions for electricity generation

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